Kana-Input Navigation System for Kids based on the Cyber Assistant

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Abstract

In Japan, it has increased the opportunity for young children to experience the personal computer in elementary schools. However, in order to use computer, many domestic barriers have confronted young children (Kids) because they cannot read Kanji characters and had not learnt Roman alphabet yet. As a result, they cannot input text strings by JIS keyboard. In this research, we developed Kana-Input Navigation System for kids (KINVS) based on the Cyber Assistant System (CAS). CAS is a Human-Style Software Robot based on the 3D-CG real-time animation and voice synthesis technology. KINVS enables to input Hiragana/Katakana characters by mouse operation only (without keyboard) and CAS supports them by using speaking, facial expression, body action and sound effects. KINVS displays the 3D-Stage like a classroom. In this room, Blackboard, Interactive parts to input Kana-characters, and CAS are placed. Mouse input method of KINVS are designed to use only single click and wheeler rotation. To input characters, Kids clicks or rotates the Interactive Parts. KINVS reports all information by voice speaking and Kana subtitles instead of Kanji text. Furthermore, to verify the functional feature of KINVS, we measured how long Kids had taken to input long text by using KINVS.

1. Introduction

In Japan, there are some serious domestic barriers in computer education of elementary schools, especially under 4th grade student (6-10 years old, called Kids in this paper). These barriers are,

(1) They can’t read Alphabetic characters.
(2) They can’t read difficult Kanji characters.
(3) They do not study Roman alphabet (Romaji) yet.

Because of these barriers, it’s very difficult for them to type in the long text by using keyboard. Of course, there are Kana key-tops on the JIS keyboard. But most of Japanese people type in by the method of Roman alphabet conversion because Kana key typing is very difficult. It may be because the layout of JIS-Kana keyboard was arranged according to the order of character code. As the effects, most of themes of computer education in elementary schools are restricted to the operation of the Painting Tool or Game Software [1]. To improve this problem, we developed the Kana-Input Navigation System for Kids (KINVS)

2. System Design of KINVS

Mouse operation may be easy for Kids. But the points at issue of KINVS were, 1) Let Kids concentrate to input the long text. 2) Let Kids know the usage of KINVS. 3) Let Kids feel fun to use. 4) Let Kids know the information message. As a one of solution of these, we had a try to develop a Cyber Assistant System (CAS) based on the 3D-CG real-time animation and voice synthesis technology. We already reported Cyber Teaching Assistant system [2][3][4]. CAS was developed by using the same technology.

2.1 System Structure of KINVS

KINVS displays the 3D-Stage like a classroom in the school. Blackboard is placed to display the text strings. Some Interactive Parts are placed to which Kids clicks by mouse for entering the character. (Figure 1)

The design concept of operation feelings is 3D-Game software. The reason of it is to let Kids feel fun to use, and to let them concentrate to input the long text. CAS responds the Kid’s clicking to the interactive parts by voice answer and body action. CAS also reacts the Kid’s clicking to the menu button by voice explanation. Moreover, CAS explains how to use KINVS any number of times until Kids understand. From this point of view, CAS may superior to a Human teacher.

2.2 Interactive Parts of KINVS

Table 1 shows the contents of the interactive parts. Character Rotor (CR) includes 12 of rotated Hexagons; those surfaces include all of Kana characters, Numbers and some Symbols. Each Hexagon can be rotated independently by mouse wheeler. Kana-input method is as follows.

(1) Point the mouse pointer to the target Hexagon.
(2) Rotate the Hexagon by mouse wheeler.
(3) Click the wanted surface of Hexagon.

In this moment, clicked character is displayed on the Blackboard and Word Rotor (WR) is refreshed simultaneously. WR
is a Rotated Drum and it displays 12 words those are connected with the clicked character. These words are registered in the WR database written by the XML format. If one of the words on WR (may be a wanted word) were clicked again, the character on the Blackboard would be replaced to the clicked word. As a reaction, CAS reads the entered character or word by voice speaking. At any time of operation, CAS reacts by voice speaking, facial expression and body action. Sometimes, the special sound effect plays to reply.

Table 1. Interactive Parts of KINVS

<table>
<thead>
<tr>
<th>Contents</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>Area on which text displayed.</td>
</tr>
<tr>
<td>Character Rotor</td>
<td>12 of Rotated Hexagons.</td>
</tr>
<tr>
<td>Word Rotor</td>
<td>Rotated Drum. 12 Words are displayed.</td>
</tr>
<tr>
<td>Spacer</td>
<td>Insert one space.</td>
</tr>
<tr>
<td>New line</td>
<td>Change line on the Blackboard.</td>
</tr>
<tr>
<td>Back Spacer</td>
<td>Delete 1 character.</td>
</tr>
<tr>
<td>Text Eraser</td>
<td>Delete all text entered.</td>
</tr>
<tr>
<td>Mode Changer</td>
<td>Set Hiragana or Katakana mode.</td>
</tr>
</tbody>
</table>

2.3 Functional menu of KINVS

Table 2 shows the functional menu of KINVS. Every menu is located on the button of Tool-Bar.

Table 2. Functional menu of KINVS

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text Reader</td>
<td>CAS reads the text by voice.</td>
</tr>
<tr>
<td>Text Saver</td>
<td>Save the text string entered.</td>
</tr>
<tr>
<td>Text Loader</td>
<td>Load the specified text file.</td>
</tr>
<tr>
<td>Text Sender</td>
<td>Copy the text entered to the Clipboard.</td>
</tr>
</tbody>
</table>

If button is clicked, CAS reacts by voice speaking to explain the function of it. Text Reader lets CAS read the whole text on the Blackboard to proofread the entered text. Text Saver saves the whole text string on the Blackboard to the file. Filename is assigned automatically and CAS informs the filename. This is because it’s difficult for Kids to enter the filename. Text Saver is a powerful tool. It copies the whole text on the Blackboard to the Clipboard. After Kids enters the text and copies to the Clipboard by KINVS, they can paste in the other application software. KINVS can be used as a Front End Processor to another application software.

3. Comparative Experiment

To verify the functional feature of KINVS, we did the comparative experiment by using KINVS and JIS kana keyboard. Participants are three adults and 2 Kids. Kid1 is 4th grade and Kid2 is 3rd grade student of elementary school. To improve the precision of experiment, we decided to use a theme song of TV animation picture as a manuscript, because Kids already memorized the words of a song. It includes 66 characters and it took 45 seconds to type in by using the Roman alphabet conversion. Before experiment, CAS instructed how to use KINVS. Kids looked at CAS many times with interest. Human instructor did not instruct at all. Kids enjoyed studying how to use KINVS and participated this experiment with pleasure. But after 1st experiment, Kids asked some modification. According to the request, we changed the arrangement of Hexagons in CR and inversed the direction of rotation. Figure 2 shows the result of comparative experiment. In this experiment, participants entered the manuscript by using only CR, then re-entered by using both CR and WR. The current version of WR database includes only common nouns connected with the manuscript.

4. Conclusion

We have described the summary of KINVS and reported the result of comparative experiment. Kids entered the manuscript rapidly by using CR operation of KINVS within a half of input time of Kana keyboard.

5. References